

X-rays from radio millisecond pulsars: Comptonized thermal emission?

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ABSTRACT: X-ray emission from several rotation-powered millisecond pulsars (MSPs) appears to be of predominantly thermal origin. In PSR J0437–4715, the nearest and brightest MSP known, a faint power-law tail is observed above 2.5keV. We propose that the hard emission in this and other similar MSPs is due to weak Comptonization of the thermal (blackbody or hydrogen atmosphere) emission by relativistic electrons/positrons of small optical depth in the pulsar magnetosphere above the polar caps. This result implies that all soft X-rays are of purely thermal origin, which has profound implications in the study of neutron star structure and fundamental pulsar physics.